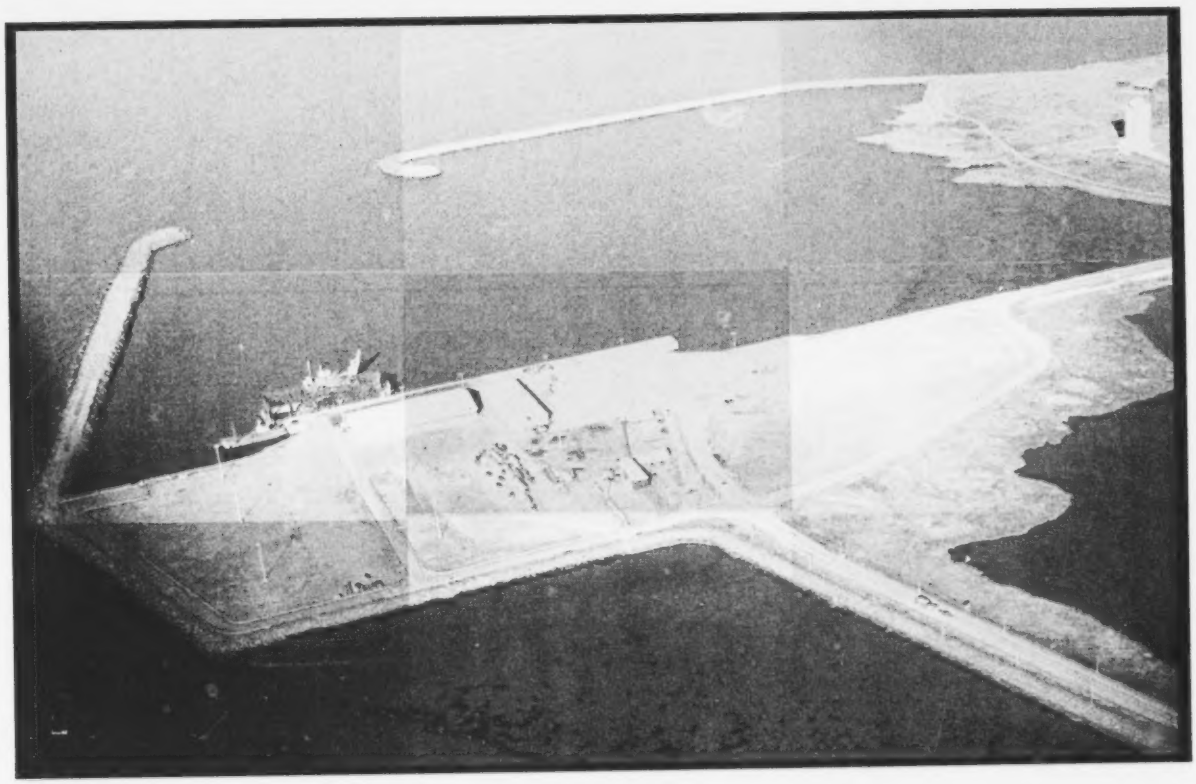
Transport Canada Transports Canada

TP 14633 E

Gros-Cacouna liquefied natural gas terminal project



TERMPOL Review Report

Final Report
November 20, 2006

Canada

FOREWORD

The Cacouna Energy Consortium established by Petro-Canada and TransCanada has announced its plan to develop and build a terminal for the importation of liquefied natural gas (LNG) in Gros-Cacouna, Quebec, which is 15 kilometres northeast of Rivière-du-Loup.

The TERMPOL Review Process (TRP)[1] was initiated at the proponent's request, as stipulated in the TERMPOL Code.[2] Further to this request, a TERMPOL Review Committee (TRC) made up of representatives[3] of various federal and provincial departments and agencies as well as specialized consultants was established to study the proponent's proposals.[4] It is the responsibility of the TRC to assess the risks to navigation and public safety that could be incurred by locating and operating an LNG terminal at Gros-Cacouna. The TRC is mandated to analyse the impact of marine operations only. Within the framework of the TERMPOL Review Process, the TRC asked the proponent to produce studies pertaining to the safety of the ships involved and the dangers that their presence, manoeuvres and operations could represent to navigation and the environment under all foreseeable weather conditions.

The TRC is conscious of the interest its report must necessarily arouse among the parties involved. Consequently, it has agreed to condense the report so as not to unduly delay its publication. The TRC also believes that the parties in question are primarily interested in its recommendations. The TRC has therefore focussed the content of the report on the recommendations themselves, several specific concerns, and the methodology that was used. The TRC nevertheless remains prepared to answer any questions about the rationale behind each one of the recommendations.

---

[1] "TERMPOL Review Process (TRP)" refers to the Technical Review Process of Marine Terminal Systems and Transshipment Sites." Transport Canada, *TERMPOL Review Process 2001*, Transport Canada Publication TP743, Ottawa, Canada.
[2] TP743, section 1.6.1.
[3] Appendix I: TERMPOL Review Committee Members.
[4] Appendix II: Key Stages of TERMPOL Process.

TABLE OF CONTENTS

FOREWORD I

TABLE OF CONTENTS II

LIST OF ABBREVIATIONS IV

INTRODUCTION 1

METHODOLOGY 3

SPECIFIC CONCERNS 5

Safety Zone Around a Ship in Transit 5

Safety Zone Around a Ship at Anchor 5

Marine Security 5

Île Rouge Passage 6

Management of Exceptional Events 6

Winter Navigation 6

Training 7

RECOMMENDATIONS 8

General Recommendations 8

Route, Approaches and Navigability 9

Mooring Procedures and Provisions 11

Ship Specifications 12

Site Plans and Technical Data 12

Transhipment of Cargo 13

Operations at the port of Gros-Cacouna 14

Port Operations Booklet, Terminal Operations Manual and Ship Safety Management Manual 15

Training 16

Emergency Response Plan 17

REMARKS 18

APPENDIX I – TRC MEMBERS 19

APPENDIX II – KEY STAGES OF TERMPOL PROCESS 23

APPENDIX III – DESIGN SHIP 24

APPENDIX IV – MEASURES FOR WINTER CONDITIONS 25

APPENDIX V – BATHYMETRIC SURVEY AREA 27

APPENDIX VI – SAFETY ZONE 28

APPENDIX VII – MARINE CHART, LES ESCOUMINS TO GROS-CACOUNA 29

APPENDIX VIII – MARINE CHART, ÎLE ROUGE TO GROS-CACOUNA 30

BIBLIOGRAPHY 31

LIST OF ABBREVIATIONS

CODES	SIGNIFICATION
CEAA	*Canadian Environmental Assessment Act*
CCG	Canadian Coast Guard
CHS	Canadian Hydrographic Service
CLSLP	Corporation of Lower St. Lawrence Pilots
CSA	*Canada Shipping Act*
EC	Environment Canada
ISPS Code	International Ship and Port Facility Security Code
LNG	Liquefied Natural Gas
LPA	Laurentian Pilotage Authority
MCTS	Marine Communications and Traffic Services
MDDEP	Quebec Department of Sustainable Development, Environment and Parks
MTQ	Quebec Department of Transportation
NWPA	*Navigable Waters Protection Act*
TC Ports Operation	Transport Canada Ports Operation
TCMS	Transport Canada Marine Safety
TERMPOL	Technical review of marine terminal systems and transshipment sites
TP743	Transport Canada publication entitled *TERMPOL Review Process 2001*
TRC	TERMPOL Review Committee
TRP	TERMPOL Review Process

INTRODUCTION

Further to Cacouna Energy's announcement that it plans to develop an LNG terminal in Gros-Cacouna, the TERMPOL Review Process (TRP) was initiated at the proponent's request, as stipulated in the TERMPOL Code. A TERMPOL Review Committee (TRC) was formed to analyse this project in accordance with the TRP.

The TRP is an analysis process designed to assess the risks to navigation and public safety that could be incurred by locating and operating marine terminals and transhipment sites. Other concerns relevant to the activities of an LNG importation site are the responsibility of the government authorities of competent jurisdiction, within the limits of enforcement of their respective acts, regulations and by-laws.

The TRP focuses on a design ship's[5] selected route in waters under Canadian jurisdiction to its berth at the proposed marine terminal and, in particular, on the process of cargo handling between ship and shore. The TRP applies to the specialized equipment and procedures necessary at the proposed liquefied gas terminals, the proposed transhipment facilities and any proposed changes to existing terminals.

The intent of the TRP is to improve the elements of the project, as presented by the proponent, that could in certain circumstances threaten the integrity of the ship's hull and its cargo containment system and, consequently, the environment in the vicinity of the design ship while it is navigating in waters under Canadian Jurisdiction or engaged in cargo transfer operations alongside the proposed terminal. Particular attention is paid in the TRP to operational safety measures in site-specific circumstances and along the associated navigational routes.

The TRP does not apply to the actual construction of the terminal, nor is it intended to assess the terminal's on-land facilities and installations. Nevertheless, the TRP addresses several specific "terrestrial" aspects such as the terminal wharf structure, mooring equipment specifications, and those aspects of the terminal's operation and emergency response planning that are applicable to

[5] Appendix III, Design Ship.

the design ships that will be using the terminal. This inclusion of terrestrial elements in the vicinity of the berth is minimal, but necessary in order to take into account all safety considerations. Moreover, since the Cacouna Energy Project is subject to CEAA regulatory processes, the TRC has left the assessment of certain aspects, such as the impact on fishery resources, to the concerned authorities.

The TRP does not prescribe detailed standards for the siting, design, construction, and operation of the marine terminal and transportation systems. The TRP is not meant to replace the requirements of the environmental impact assessment process required under the CEAA or the process to assess the impact of the LNG terminal on navigation pursuant to the NWPA. Nor does the TRP replace the safety, security and environmental requirements of any other acts and regulations that are in effect.

The TRP is not a process for the approval or denial of a specific project. Any such approvals must be obtained by the proponent from the appropriate regulatory authorities, in accordance with their own specific processes.

The TRP is used to analyze a project in order to determine its potential impact on the existing regional navigation system and to propose, if necessary, measures to mitigate that impact or to improve the safety of tankers and operations at the marine terminal.

METHODOLOGY

Cacouna Energy submitted the documentation required under the TRP in five volumes. Each of these volumes addresses a specific subject:

Volume 1: *Marine Traffic Survey*;

Volume 2: *Design Ship and Navigation Routes*;

Volume 3: *Casualties and Risks*;

Volume 4: *Description of Marine Terminal*; and

Volume 5: *Manuals*[6].

In order to find in these volumes the information required for each of the studies demanded by TERMPOL, the proponent has established a concordance table. Three studies described in Part 3 of the TERMPOL Code[7] were not required by the TRC because their scope did not specifically apply to the Cacouna Energy Project. They are:

- single point mooring provisions and procedures;
- oil handling facilities requirements; and
- hazardous and noxious liquid substances.

The LNG carriers will follow regular navigational routes. These routes are well established, and most ships use a voluntary routing system from the entrance to Cabot Strait or the Strait of Belle Isle to the Les Escoumins pilot station. In this sense, the origin, destination and marine traffic surveys and the offshore exercise and offshore exploration and exploitation activities surveys[8] detailed in *Volume 1* do not serve to determine the optimum route in terms of navigation safety, as mentioned in TP743, but rather to support the risk assessment developed in *Volume 3* submitted by Cacouna Energy.

---

[6] The port information booklet, the terminal operation manual and the emergency response plans of the terminal and the LNG carrier.

[7] TP743E, *Termpol Review Process 2001*, Part 3, paragraphs 3.14, 3.19 and 3.20.

[8] TP743, *Termpol Review Process 2001*, Part 3, paragraphs 3.2 and 3.4.

The purpose of the TRC's work is not to approve the studies presented by the proponents, but rather to use their content to review the project and draft its report. For each TRP study described in Part 3 of TP743, the TRC ensured that the required information was in the various volumes submitted by the proponent. For points requiring clarification, the TRC asked the proponent to provide additional information.

Figure 1 is a schematic representation of the procedure followed by the TRC. In TP743, the purpose of each study is clearly specified. The TRC therefore verified whether data and information provided by the proponent met the needs of the committee. Discussions between the proponent and the TRC took place from the time the first studies were submitted until the final report was produced, in order to provide clarifying information and make any necessary changes to the project. The content of the studies was analysed by the TRC. The documentation work, however, also included the examination of international standards and regulations, participation in specialised training on LNG marine transportation and visits of LNG terminals and carriers in operation. Select committee meetings were held, discussions were conducted by electronic mail and internal consultations were carried out as required in certain organizations. The consequences and impact of LNG carrier traffic were assessed in light of the studies submitted, the documentation consulted, the information gathered and the existing situation. Following this assessment, the TRC proposed recommendations to the various stakeholders. Some recommendations are aimed at ensuring the implementation of the measures proposed by the proponent, while others are intended to improve certain elements of the project. In the expert view of the various TRC members, the implementation of these recommendations would reduce the risks and threats to the integrity of ship hulls and their cargo containment systems and consequently to the environment.

As marine operations and their context may evolve and change over the terminal's years of operation, the TRC identified a number of elements that, in changing, would make it necessary to review operating standards.

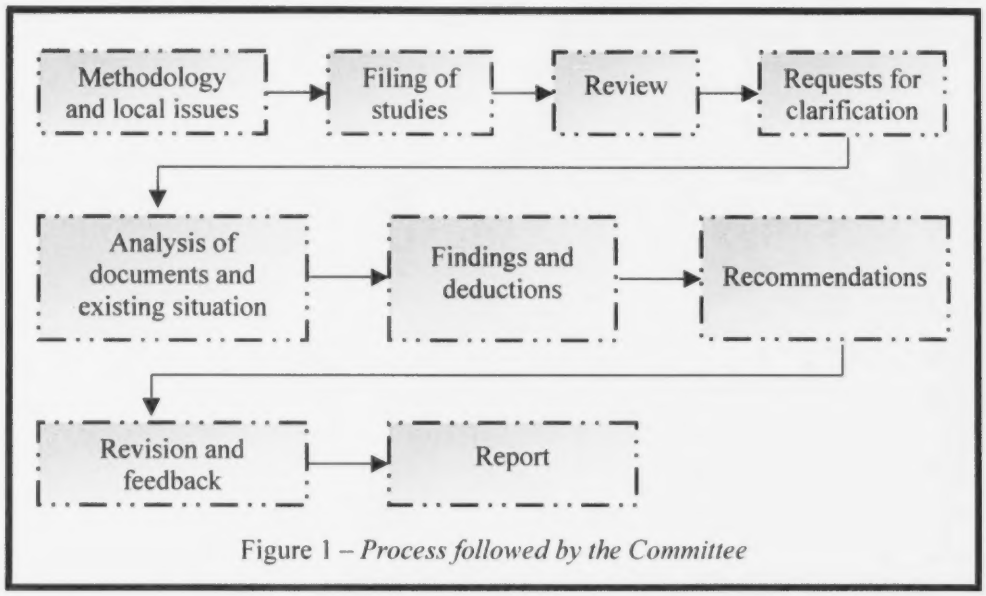


Figure 1 – *Process followed by the Committee*

SPECIFIC CONCERNS

Safety Zone Around a Ship in Transit[9]

The Committee sees no justification at this time for establishing safety zones around ships in transit. The Committee believes that the *Collision Regulations*, the existing marine traffic organization and communication systems and the compulsory pilotage area are sufficient tools for ensuring navigational safety.

Safety Zone Around a Ship at Anchor

Under the *Routing Standards* (TP 1802), a safety zone may be required for safety reasons or to protect the environment. Taking this concern into account in the present context, the TRC sees no justification at this time for creating a safety zone around a ship at anchor.

Marine Security

The TRC considered the questions pertaining to deliberate acts against LNG carriers and terminals that might have repercussions on safety, the environment and property. In Canada, these concerns are governed by the *Marine Transportation Security Act* and the *Marine Transportation Security Regulations*. Under the terms of these regulations, LNG carriers and

[9] As defined in TP 1802, *Routing Standards*.

terminals must have an **approved security plan**. These plans are developed in light of vulnerable elements identified at the time of assessment of operations and installations. They put in place means for reducing risks and countering threats. Such means are adapted to match the identified threat level. Since the measures to protect against such acts are already governed by a sufficient regulatory framework, the TRC felt there was no need to make specific recommendations with regard to such measures. In addition, it should be noted that authorities evaluate threats continuously. Presently, these authorities have informed the Committee that there is nothing to indicate a need for additional measures for LNG carriers because the authorities believe the regulatory measures already in place are sufficient to counter such acts.

Île Rouge Passage

The Committee sees justification to give preference to the passage south of Île Rouge. Studies filed by the proponent indicate that the corridor south of Île Rouge provides a navigation passage that is wider, more direct and less traveled. However, the passage north of Île Rouge may also be used whenever this route is deemed safer by the bridge team according to information transmitted by MCTS.

Management of Exceptional Events

Exceptional events, such as damage at sea, collisions, groundings or equipment failures, that could occur to LNG carriers in Canadian waters raised concerns among the various parties at the time of the project examination. Such exceptional events involving ships are presently managed by a well-established set of procedures involving many departments and agencies. The TRC analyzed the possibility of LNG carrier involvement in such events and determined that the existing mechanisms are appropriate for addressing these situations.

Winter Navigation

The severe navigation conditions prevailing in winter in the Gulf of St. Lawrence and the St. Lawrence River call for special measures to ensure navigation safety. Accordingly, the TRC supports the implementation of the measures specifically developed[10] by Cacouna Energy to deal with winter navigation conditions, since these measures meet or exceed CSA requirements.

---

[10] Appendix III, Design Ship and Appendix V, Measures for Winter Conditions.

In addition, the TRC proposes that Cacouna Energy put in place a control procedure to ensure that spot-chartered vessels meet the same winter safety and operating standards as permanently chartered vessels.

Training

While reviewing the project and the current situation, the Committee noted the existence of a continuing education program for CLSLP pilots, the content of which is approved by the LPA. The TRC suggests that the following be included in this program:

- training for all pilots assigned to LNG carriers on the various aspects of cryogenic cargo transportation and handling as well as on emergency response actions; and
- manoeuvre training adapted to LNG carriers and the Gros-Cacouna terminal, for pilots who will be manoeuvring carriers into and out of terminal berths.

The suggested training should be incorporated into the continuing education program before the terminal goes into operation.

RECOMMENDATIONS

The following recommendations are intended to ensure or improve the safety of navigation and operations at the terminal facilities.

General Recommendations

1. The Committee recommends that Cacouna Energy make available at all times, at the request of Transport Canada or Environment Canada, all manuals and documents[11] pertaining to ships and transhipment facilities in order to check the compliance of equipment and operations.

2. The Committee recommends that Cacouna Energy establish a process for periodic meetings with Transport Canada and the organizations concerned in order to assess whether current safety measures related to ship and terminal operations are still appropriate.

3. The Committee recommends that Cacouna Energy submit to Transport Canada for review any proposed change to marine operations that has not been reviewed within the framework of the present TERMPOL review process.

4. The Committee recommends that Cacouna Energy submit to TCMS for review all procedures and information being the subject of the recommendations pertaining to:
    - ice adviser competency (recommendation 8);
    - marine traffic management at the pilot station (recommendation 9);
    - transit authorization (recommendation 13);
    - weather and ice conditions (recommendation 14);
    - tug availability (recommendation 20);
    - bathymetry (recommendation 28); and
    - boarding and disembarking of ice advisers (recommendation 46).

5. To avoid any confusion during berthing manoeuvres or transhipment operations, the Committee recommends that Cacouna Energy adopt a policy establishing measures to

[11] Manuals, record books, procedures, plans, etc. Copies of these documents should be supplied to authorities as and when required.

ensure that communications are carried on in a common language. This policy concerns communications between personnel on tugs and LNG carriers and at the terminal.

Route, Approaches and Navigability

6. The Committee recommends that TCMS and CCG jointly establish procedures to authorize, if necessary, the use of appropriate places of refuge for LNG carriers in need of assistance.

7. The Committee recommends that Cacouna Energy implement its proposal to make use of ice advisers for the transit of LNG carriers during the winter in the Gulf of St. Lawrence, and Cabot Strait as far as Les Escoumins.

8. The Committee recommends that TCMS, in conjunction with CCG, establish a procedure for verifying the competency of ice advisers.

9. The Committee recommends that MCTS, Cacouna Energy and CLSLP establish a procedure to manage marine traffic within the pilot boarding and disembarking area at the Les Escoumins pilot station as follows:
    - No other ship may be in the boarding area when there is an LNG carrier in the boarding area.
    - LNG carriers must remain at least one nautical mile from the shore at all times.
    - A greater distance from shore may also be required by MCTS officers or pilots based upon their assessment of the existing situation during the LNG carrier's approach.

10. The Committee recommends that Cacouna Energy make sure that a tug accompanies the LNG carrier and is ready to intervene before Île Rouge (buoy K51), when the ship is in its approach to the terminal.

11. The Committee recommends that Cacouna Energy make sure that tugs assisting an LNG carrier during berthing manoeuvres are positioned alongside the LNG carrier as soon as it is at a minimum distance of one nautical mile from the dock.

12. The Committee recommends that Cacouna Energy establish an operating procedure to ensure that berthing manoeuvres are carried out only when visibility is at least one nautical mile and visibility is sufficient to allow tug crew members and ship's bridge team members to be in sight of one another at all times.

13. The Committee recommends that Cacouna Energy establish a procedure whereby LNG carriers would be authorized to transit to the terminal only once it has been determined that a favourable meteorological window of 36 hours is available (subject to the restrictions mentioned in recommendation 44) to carry out transhipment operations, and that Cacouna Energy provide this procedure to TC Ports Operation.

14. The Committee recommends that Cacouna Energy establish a procedure to monitor weather and ice conditions and forecasts and keep a log of these conditions.

15. The Committee recommends that TC Ports Operation limit the speed of ships within the limits of the port of Gros-Cacouna to 8 knots over the ground.

16. The Committee recommends that Transport Canada develop jointly with CLSLP a procedure to ensure that ships waiting at anchor to enter the port of Gros-Cacouna or the LNG terminal do not adversely affect the channel to the port of Gros-Cacouna or the LNG terminal.

17. The Committee recommends that Cacouna Energy establish a procedure for the operation of the system of aids to navigation in the vicinity of the terminal.

18. The Committee recommends that Cacouna Energy install and maintain a dockside tide gauge at the terminal to determine the water column actually available at the dock.

Mooring Procedures and Provisions

19. Before ships in the 200,000 m^3 class are authorized to visit the terminal, the Committee recommends that Transport Canada obtain from Cacouna Energy the results of manoeuvring simulations as well as the mooring and docking plan for these ships to ascertain whether these ships may visit the terminal.

20. The Committee recommends that Cacouna Energy put in place a procedure to ensure the availability of sufficient tug support to ensure the safe departure of LNG carriers at all times.

21. The Committee recommends that Cacouna Energy establish control measures to guarantee that sufficient crewmembers are on board LNG carriers throughout their stay at the terminal to perform the ship's essential and emergency duties.

22. The Committee recommends that Cacouna Energy establish an operating procedure stipulating that LNG carriers must be ready to sail at any time when they are at the terminal or at anchor.

23. The Committee recommends that Cacouna Energy implement its proposal to keep pilots on board throughout a ship's call at the dock.

24. Since it has been determined that a specific number of tugs is required at all times to assist LNG carriers as and when required, the Committee recommends that TCMS and CCG jointly establish procedures for assessing and authorizing, if necessary, the requisition for search and rescue purposes of tugs assigned to the LNG terminal.

Ship Specifications

25. The Committee recommends that TCMS put in place and maintain a specific inspection program for LNG carriers, similar to the existing first tanker visit program.[12]

26. The Committee recommends that Cacouna Energy establish a procedure to ensure that LNG carriers with the annotation "unmanned machinery space" post a watch in the machinery compartment in the following situations:
    - at least one hour before arriving at a pilot station;
    - when the ship is in a compulsory pilotage area;
    - when the ship is in ice-infested waters; and
    - during transhipment of cargo.

27. The Committee recommends that Cacouna Energy establish a procedure to ensure that both steering gear engines in LNG carriers are in operation at least one hour prior to arrival at the Les Escoumins pilot station.

Site Plans and Technical Data

28. The Committee recommends that Cacouna Energy perform a bathymetric survey, in accordance with CHS standards and requirements, immediately upon completion of the works and prior to the arrival of the first ship, in the area bound by the following geographic coordinates:[13]
    - Point 1, Lat 47° 59.104′ N Long 069° 32.059′ W;
    - Point 2, Lat 47° 59.216′ N Long 069° 30.618′ W;
    - Point 3, Lat 47° 57.246′ N Long 069° 30.322′ W;
    - Point 4, Lat 47° 55.586′ N Long 069° 31.647′ W;
    - Point 5, Lat 47° 55.535′ N Long 069° 36.497′ W; and
    - Point 6, Lat 47° 57.817′ N Long 069° 34.271′ W.

    Cacouna Energy shall communicate the survey results to CHS.

---

[12] Under this program, oil tankers are inspected at the time of their first visit to a Canadian port, then annually.
[13] See Appendix V, Bathymetric Survey Area.

29. The Committee recommends that CHS take the following elements into account when updating nautical charts and publications:

- the addition of all marine infrastructure, including the aids to navigation system;
- anchorages likely to be used by LNG carriers;
- the suppression of symbols and references pertaining to small craft anchoring sites near the terminal;
- the presence of 11.2 m shoal waters and any other obstructions to navigation identified in the bathymetric survey conducted upon the completion of work on the LNG terminal; and
- notices and warnings pertaining to the presence of LNG carriers, as required and prepared by government authorities.

30. The Committee recommends that Transport Canada require Cacouna Energy to take the necessary steps to prevent boat traffic in the vicinity of the LNG terminal. Such measures should include the installation and maintenance of a device to prevent boat access beneath LNG terminal structures when there is no ice.

31. The Committee recommends that TC Ports Operation, in collaboration with Cacouna Energy, establish a procedure to restrict anchorage within the safety perimeter established around the marine terminal[14] in accordance with the CSA Z276-01 standard.[15]

Transhipment of Cargo

32. The Committee recommends that Cacouna Energy establish an annual audit system to be executed by firms recognized by the federal authorities and focusing on marine terminal operating procedures and equipment. The Committee further recommends that a record be prepared and kept of these audits.

[14] See Appendix VI, Safety Zone.
[15] This standard relates to production, storage and handling of LNG (see bibliography).

33. The Committee recommends that Cacouna Energy establish a control measure to ensure that personnel assigned to transhipment operations is not assigned to other tasks at the same time.

34. The Committee recommends that Cacouna Energy incorporate into its safety measures the applicable principles set out in the latest versions of the publications *International Safety Guide for Oil Tankers and Terminals* and *Liquified Gas Handling Principles on Ships and in Terminal*.

35. The Committee recommends that Cacouna Energy incorporate into its procedures regarding operations between LNG carriers and the terminal the safety checklists described in the latest version of the publication *Liquefied Gas Handling Principles on Ships and in Terminals*.

Operations at the port of Gros-Cacouna

36. The Committee recommends that TC Ports Operation re-evaluate the allowable criteria for handling explosives for the port of Gros-Cacouna.

37. The Committee recommends that TC Ports Operation obtain the cargo manifests of ships visiting the port of Gros-Cacouna in order to identify, in collaboration with TCMS, the goods that could pose a potential threat to the operation of the LNG terminal and the port of Gros-Cacouna. The committee further recommends that a log be kept of the goods handled and that special measure or procedures that have been put in place be recorded therein.

38. The Committee recommends that Cacouna Energy and TC Ports Operation jointly establish a procedure to maintain a permanent communication network between those responsible for LNG carriers, the LNG terminal, the port of Gros-Cacouna and the tugs.

Port Operations Booklet, Terminal Operations Manual and Ship Safety Management Manual

39. The Committee recommends that Cacouna Energy submit to TCMS for review, at least six months prior to the start of operations, the Port Operations Booklet and the Terminal Operations Manual.

40. The Committee recommends that Cacouna Energy make the Port Operations Booklet and the Terminal Operations Manual available in both of the official languages of Canada.

41. The Committee recommends that Cacouna Energy ensure that the Terminal Operations Manual includes procedures pertaining to:
    - language of work (recommendation 5);
    - availability of tugs (recommendations 20);
    - safe crewing (recommendation 21);
    - readiness to sail (recommendation 22);
    - pilots on board ships (recommendation 23); and
    - transhipment of cargo (recommendations 33, 34 and 35).

42. The Committee recommends that Cacouna Energy produce a table describing all the situations requiring the stoppage of transhipment operations, and that Cacouna Energy incorporate this table into the Terminal Operations Manual.

43. The Committee recommends that Cacouna Energy ensure that the Port Operations Booklet includes procedures and being the subject of the recommendations pertaining to:
    - language of work (recommendation 5);
    - traffic management at the pilot station (recommendation 9);
    - availability of tugs (recommendations 10 and 11);
    - docking criteria (recommendations 12 and 13);
    - speed limits (recommendation 15);
    - aids to navigation system (recommendation 17); and
    - engine room operations (recommendations 26 and 27).

44. The Committee recommends that Cacouna Energy produce a table describing all the limiting conditions described in the submitted studies for LNG carrier departures and arrivals, and that Cacouna Energy incorporate this table into the Port Operations Booklet. This table should include at least the following:

- weather factors;
- maximum lateral approach speed;
- number of tugs required and their bollard pull capacities; and
- conditions under which an LNG carrier should leave the dock.

45. The Committee recommends that Cacouna Energy ensure that the LNG Carrier Safety Management Manual includes procedures and information being the subject of the recommendations pertaining to:

- safe crewing (recommendation 21);
- readiness to sail (recommendation 22);
- engine room operations (recommendations 26 and 27); and
- transhipment of cargo (recommendations 33, 34 and 35).

46. The Committee recommends that Cacouna Energy take appropriate action to ensure that the LNG Carrier Safety Management Manual includes procedures pertaining to boarding and disembarking the ice adviser.

Training

47. The Committee recommends that Cacouna Energy, in conjunction with those responsible for the fleet of tugs, develop a training program that takes into account the training criteria cited in standards CSA Z276-01 and NFPA 59A[16] concerning:

- dangers associated with the transportation and handling of cryogenic cargo;
- emergency situations, firefighting, etc.; and
- the equipment specific to each tug (firefighting FIFI 1).

[16] These standards relate to production, storage and handling of LNG (see bibliography).

The Committee further recommends that employees receive this training before they are assigned to work on tugs assisting LNG carriers.

48. The Committee recommends that Cacouna Energy develop, implement and maintain, in accordance with standards NFPA 59A and CSA Z276-01, a training program for all individuals involved with the terminal.

Emergency Response Plan

49. The Committee recommends that Cacouna Energy submit to TC Ports Operation, TCMS and EC for review, at least six months prior to the start of operations, the emergency plan for the LNG terminal.

50. The Committee recommends that TCMS, TC Ports Operation and CCG participate in the work of the municipality-industry joint committee (CMMI) as it relates to the terminal emergency plan.

REMARKS

This report, produced by the TERMPOL Review Committee (TRC), should not be considered a policy statement or deemed to have complete or partial government support. The report merely constitutes the considered opinion of the representatives of various departments and agencies who reviewed the proponent's proposals and drafted the report.

The TRC's analysis took into consideration the present marine context as well as the information, documentation and technologies available at the time the report was written. Some aspects of the project may need to be re-evaluated if warranted by the marine context in future or if the start of terminal operations, and consequently the arrival of the first ships, are substantially delayed.

This report was produced specifically in connection with the LNG terminal project at Gros-Cacouna proposed by Cacouna Energy consortium. Because each project assessed under the TRP is analysed on the basis of studies supplied by the proponent, this report cannot be applied to other projects.

The implementation of the report's recommendations is the responsibility of the departmental officials responsible for regulation or of the proponent, as the case may be. Therefore, the recommendations in this report may invite the participation of many organisations according to their respective areas of expertise and the legislation they are responsible for enforcing.

APPENDIX I – TRC MEMBERS

Name	Organization and Title	Roles	Areas of Competency
Michel Boulianne	TCMS (Quebec) Cargoes and Pollution Prevention Division Manager	Chair Drafting Committee	• Master • Navigation • Navigation safety • Safe transportation of cargo • Inspection and certification of ships • Certification of mariners • Marine safety policies and legislation
Danielle Duranceau	TCMS (Quebec) Cargoes and Pollution Prevention Division Marine Surveyor	Coordinator Drafting Committee	• Master • Navigation • Inspection and certification of ships • Certification of mariners • Marine safety policies and legislation
Mario Lavoie	TCMS (Rimouski) Marine Surveyor	Member Drafting Committee	• Master • Navigation • Inspection and certification of ships • Certification of mariners • Marine safety policies and legislation
Marcellin Papillon	TCMS (Quebec) Technical Division Manager	Member	• Marine Engineering Mechanic 1st Class • Technical knowledge • Ship building and equipment • Minimum safe manning • Inspection and certification of ships • Certification of mariners
Jacques Fortin	TCMS (Quebec) Technical Division Marine Surveyor	Member	• Naval architecture technician • Technical knowledge • Ship building and equipment • Inspection and certification of ships
Jan Zwaan	TCMS (Ottawa) Cargoes and Ship Port Interfaces Manager	Resource person	• Master • Safe transportation of cargo • Marine safety policies and legislation
Robert Turner	TCMS (Ottawa) Navigation Safety and Radio Communications Manager	Resource person	• Master • Navigation safety • Marine safety policies and legislation
Louis Gauthier	Transport Canada (Ottawa) Legal Services Attorney	Resource person	• Marine laws

Name	Organization and Title	Roles	Areas of Competency
Michel Demers	Transport Canada Navigable Waters Protection Manager	Member	• *Navigable Waters Protection Act*
René Laperrière	TC- Navigable Waters Protection Navigable Waters Protection Officer	Member	• *Navigable Waters Protection Act*
Pierre Laframboise	TC- Navigable Waters Protection (Ottawa) Navigable Waters Protection Officer	Resource person	• *Navigable Waters Protection Act*
Louis Rodrigue	TC- Transportation Security and Emergency Preparedness (Quebec) Manager, Marine Security	Member	• Marine engineering Mechanic 1st Class • *Marine Transportation Security Act* • ISPS
Daniel Morin	TC- Transportation Security and Emergency Preparedness (Quebec) Regional Inspector	Member	• *Marine Transportation Security Act* • ISPS
Élaine Bolduc	TC- Environment Affairs Engineer, Projects and Environmental Compliance	Member	• *Canadian Environmental Protection Act* • Liaison with CEAA
Serge Bélanger	TC- Ports Operation Project Manager	Member	• Authority on port area
Richard Sanfaçon	CHS Data Acquisition Manager	Member	• Bathymetry • Nautical charts and publications
Martin Blouin	CCG Environmental Response Supervisor	Member Drafting Committee	• Master • Navigation • Ice navigation • Liaison with: - MCTS - Icebreaking Services - Navigable Waterways - Environmental Response - Search and Rescue Aids to navigation

Name	Organization and Title	Roles	Areas of Competency
Phil Lightfoot	Natural Resources Canada Canadian Explosives Research Laboratory Manager	Member	• Risk analyses
Bert Von Rosen	Natural Resources Canada Canadian Explosives Research Laboratory	Member	• Risk analyses
Louis Breton	Environment Canada Environmental Assessment Analyst	Member	• Canadian environmental policies and legislation
Robert Reiss	Environment Canada Environmental Emergencies Emergency Responder	Resource person	• Canadian environmental policies and legislation
Denys Pouliot	LPA Director of Operations	Member	• Master • *Pilotage Act* • Management of pilotage services
Simon Pelletier	CSLPP	Member	• Master • CLSLP Class A pilot • Pilotage • Navigation • Knowledge of the waterway (Les Escoumins – Quebec City) • Shiphandling
Sylvain Desgagnés	Ice Adviser	Resource person	• Master • Ice adviser • Harbour pilot • Winter navigation in the Gulf • Shiphandling
Jacques Bélanger	Civil Protection Lower St. Lawrence and Gaspé—Magdalen Islands Regional Branch	Resource person	• Quebec civil protection policies and legislation
Yves Rochon	Quebec Department of Sustainable Development, Environment and Parks Coordinator, Watercourse and Water Body Development Projects Water Projects Service Environmental Assessments Branch	Resource person	• Quebec environmental policies and legislation

Name	Organization and Title	Roles	Areas of Competency
Pierre Chebou	Quebec Department of Transportation	Resource person	• Quebec transportation policies and legislation

APPENDIX II – KEY STAGES OF TERMPOL PROCESS

Chronology of key stages in the TERMPOL process																												
	2004			2005													2006											
	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November
Letter from the proponent requesting initiation of the review process	20																										
Meeting with the proponent to establish the operating terms and conditions of the review process			08																								
Submission by the proponent of marine traffic studies								12																			
Submission by the proponent of other required studies														28,29													
Review of studies and documents by TRC								→	→	→	→	→	→	→	→	→	→	→	→	→	→	→					
Communications with, questions and requests for clarification to the proponent				→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→					
Drafting of report																			→	→	→	→	→				
Revision, feedback and translation																							→	→	→		
Publication of review report																											X

APPENDIX III – DESIGN SHIP

The terminal is being designed to accept LNG carriers ranging from 70 000 m3 to 216 000 m3.

For the purpose of risk assessment, the proponent considered LNG carriers of 145 000 m3 and 216 000 m3.

For manoeuvering simulations, a spherical tank LNG carrier of 135 477m3 was used.

The following table shows the main parameters of the LNG carrier considered for the trade which is a ship of 165 000 m3 and the parameters of the ship used for manoeuvring simulations.

Design Ships	LNG Carrier	Manoeuvring Simulations
Cargo Capacity	165 000 m^3	135 477 m^3
Cargo Containment	Membrane or spherical tanks	Spherical tanks
Cargo Boil-off Rate	0,12 % per day at 45 °C air/32 °C seawater	N/A
Cargo Discharge Rate	12 000 m^3 per hour (3 unloading arms on dock.)	N/A
Service speed	19,5 kts in loaded condition	20 kts
Length overall	280 m	293 m
Beam	45 m	45.75 m
Depth to main deck	25 m	25m
Maximum draft	12 m	11.25 m
Deadweight	85 000 t	71 543 t
Displacement	105 000 t	101 800 t
Gross Register Tonnage	120 000 t	110 875 t
Net Register Tonnage	75 000 t	33 269 t
Ice Class	ABS 1A, Canadian Class B	N/A
Propulsion	Single or twin screw, dual fuel medium speed diesel.	Steam turbine 39 020 HP
Bow Thruster	---	Screw Diameter 2 400 mm Power 1 620 kW
Design Service Life	40 years	N/A

APPENDIX IV – MEASURES FOR WINTER CONDITIONS[17]

1.19.1 General Deck Icing

Recently vessels transiting the St. Lawrence have been constructed with a protective "hood" over the bow. This hood substantially reduces the icing problems and the Ice class LNG carriers calling at Gros-Cacouna will be fitted with this style of hood. A low-pressure general service deck steam system with hose connections will be provided for general de-icing.

1.19.2 Deck Machinery

Deck winches, windlasses and cranes will be hydraulically powered using hydraulic fluid suitable for low-temperature operation. Hydraulic power packs will include heating and be located in heated spaces. The hydraulic system will be capable of continuous circulation. Trace heating is to be arranged at winch and windlass operating positions.

1.19.3 Ship Machinery

The following additional winterization features will be incorporated:

- Boiler capacity sized to handle steam heating of machinery spaces, engine and emergency generator intake fans, bunker line steam tracing, sea chests.
- Low seawater suctions for essential plant will be arranged to minimize slush build up and will be provided with heating coils and a steam blow out system.
- The main cooling water system will have cross connection with the ballast system to allow re-circulation in the event of blocked sea water inlets.

Other winterization features will include:

- Heated navigation bridge windows
- Trace-heated radar antennae
- Trace-heated fog horns
- Protective covers for exposed controls and instrumentation

---

[17] Section 1.19 of *Volume 2 of 5 – Design LNG Carrier and Navigation Routes.*

1.19.4 Other Measures

Other winterization design measures are:

- Specification of steel grades for structures to low ambient temperatures
- Specification of low ice friction and ice abrasion resistant hull coatings for the hull areas exposed to ice contact
- Design of protection of hull appendages such as rudder stoppers against ice impact
- Stability design for deck ice accumulation
- Design considerations such as thermal insulation and heated windows for enclosed operation spaces
- Special design provisions for in-ice work areas, accesses and emergency escape routes which may include the provision for enclosed spaces on the deck
- Special design considerations for lighting to improve visibility in heavy snow and ice conditions.

1.20 Miscellaneous Utility Systems

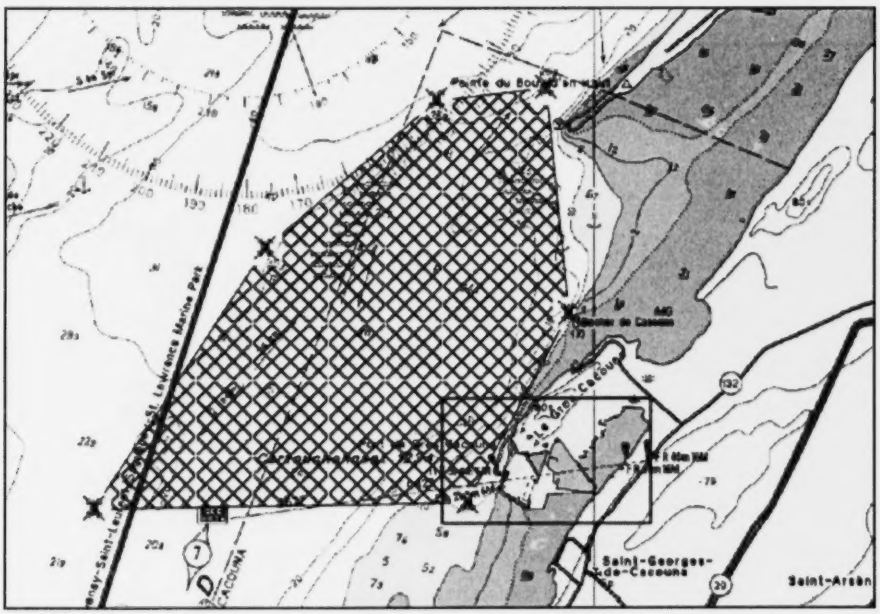
Utility systems are to be provided with sufficient redundancy to ensure uninterrupted operation in service.

1.21 Manoeuvering

Manoeuvring standards and information shall comply with latest IMO Resolutions and US Coast Guard requirements. Manoeuvring capabilities will be confirmed by physical model tests. Manoeuvring tests including ahead and astern turning circles, crash stop ahead and astern, and zigzag tests will be performed on sea trials. Rudder(s) and steering gear will be arranged to withstand ice impact loads in accordance with Class requirements for the specified ice class notation. Particular attention will be paid to the need for turning and backing in confined channels in broken ice. Bow thruster(s) and high angle Schilling rudders will be provided to maximize manoeuvrability while taking ice loading into consideration. Thrusters will be designed to resist ice impact and blocking by ice and slush.

APPENDIX V – BATHYMETRIC SURVEY AREA[18]

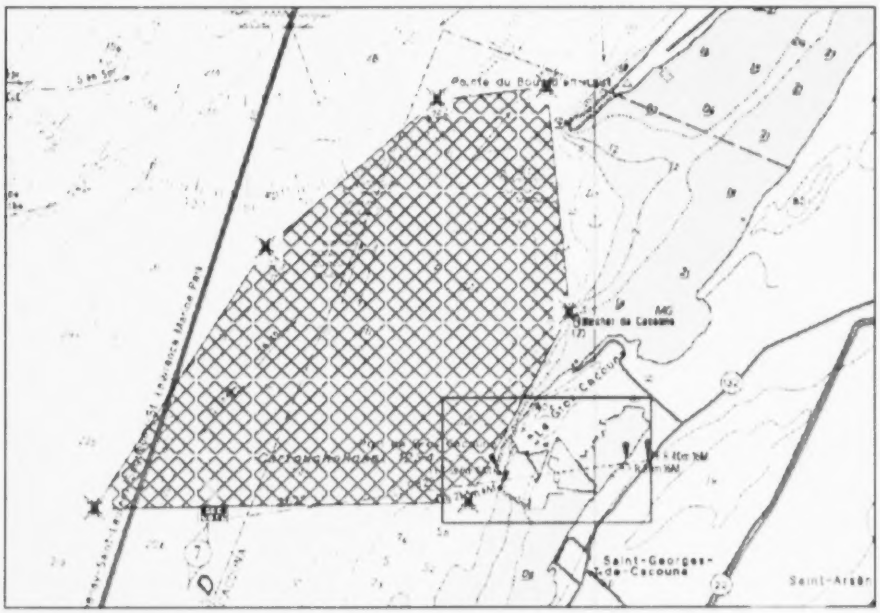
Name	Latitude	Longitude		Name	Latitude	Longitude
Point 1	47° 59.104′ N	069° 32.059′ W		Point 4	47° 55.586′ N	069° 31.647′ W
Point 2	47° 59.216′ N	069° 30.618′ W		Point 5	47° 55.535′ N	069° 36.497′ W
Point 3	47° 57.246′ N	069° 30.322′ W		Point 6	47° 57.817′ N	069° 34.271′ W



[18] See recommendation 28.

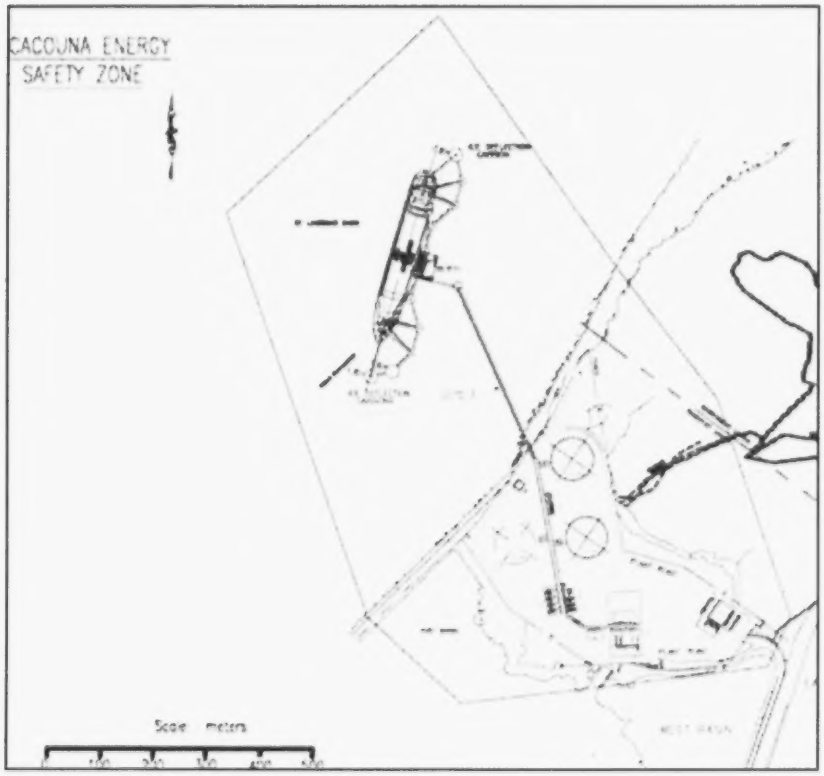
APPENDIX V – BATHYMETRIC SURVEY AREA[18]

Name	Latitude	Longitude	Name	Latitude	Longitude
Point 1	47° 59.104′ N	069° 32.059′ W	Point 4	47° 55.586′ N	069° 31.647′ W
Point 2	47° 59.216′ N	069° 30.618′ W	Point 5	47° 55.535′ N	069° 36.497′ W
Point 3	47° 57.246′ N	069° 30.322′ W	Point 6	47° 57.817′ N	069° 34.271′ W



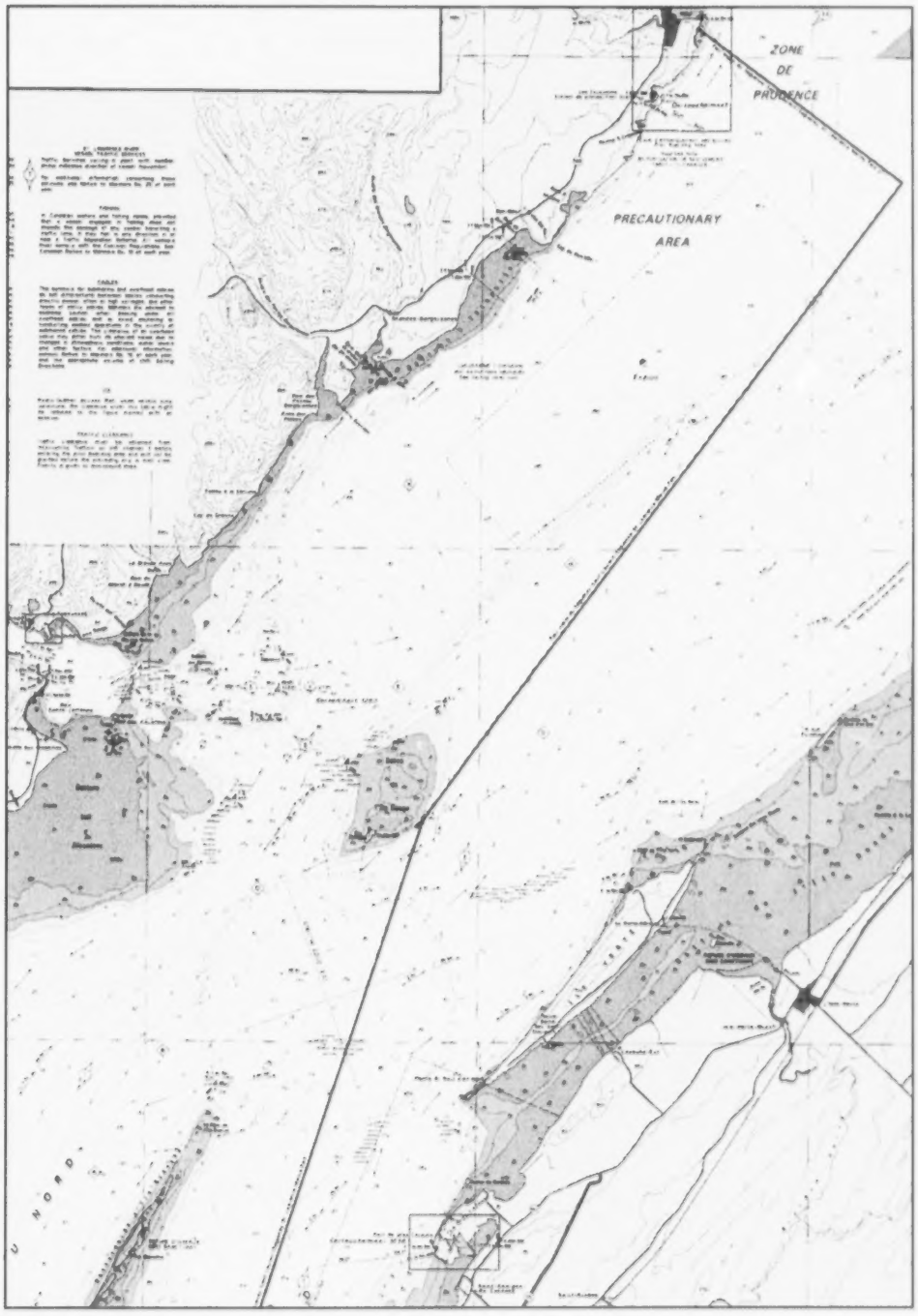
[18] See recommendation 28.

APPENDIX VI – SAFETY ZONE[19]

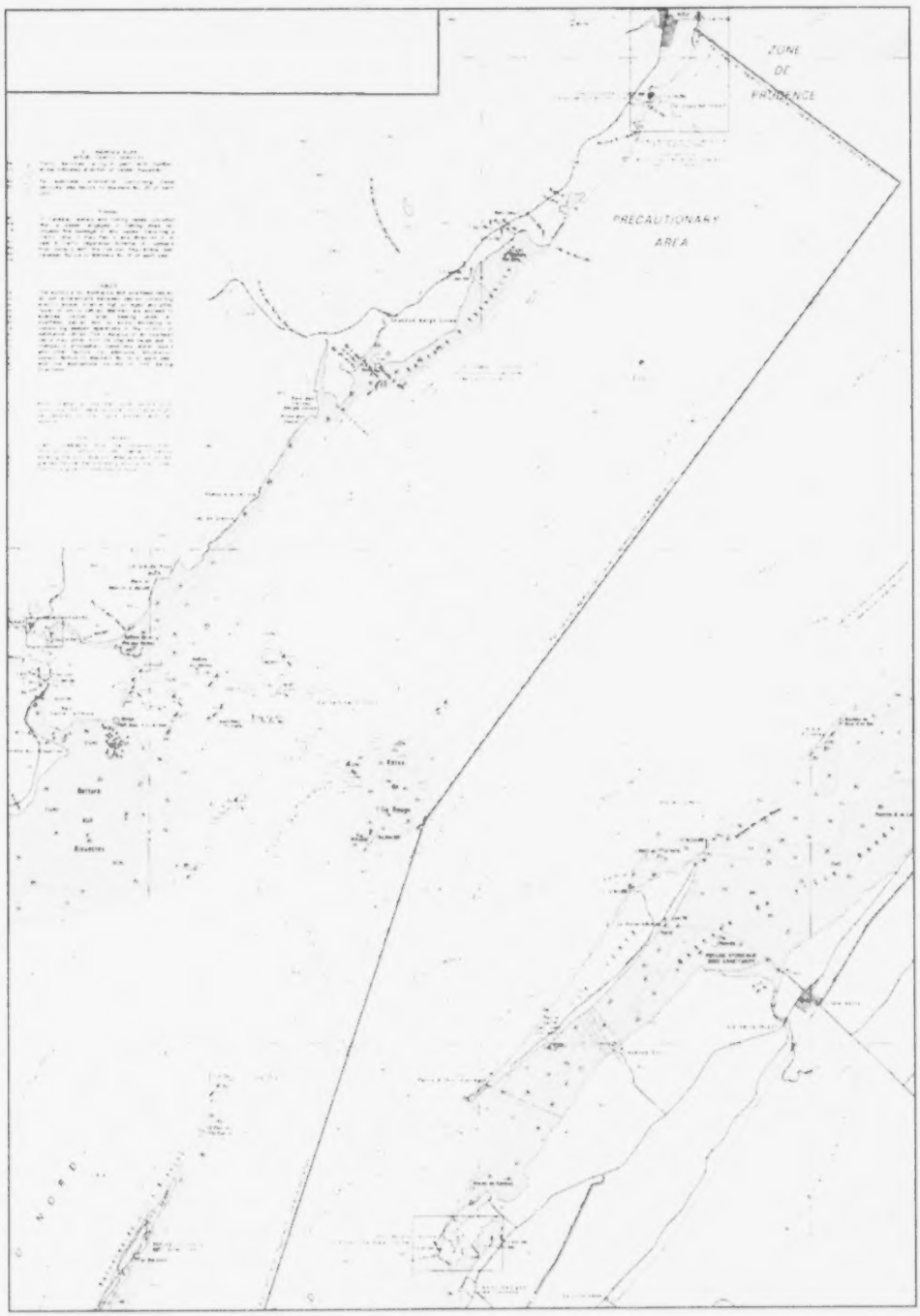


[19] See recommendation 31.

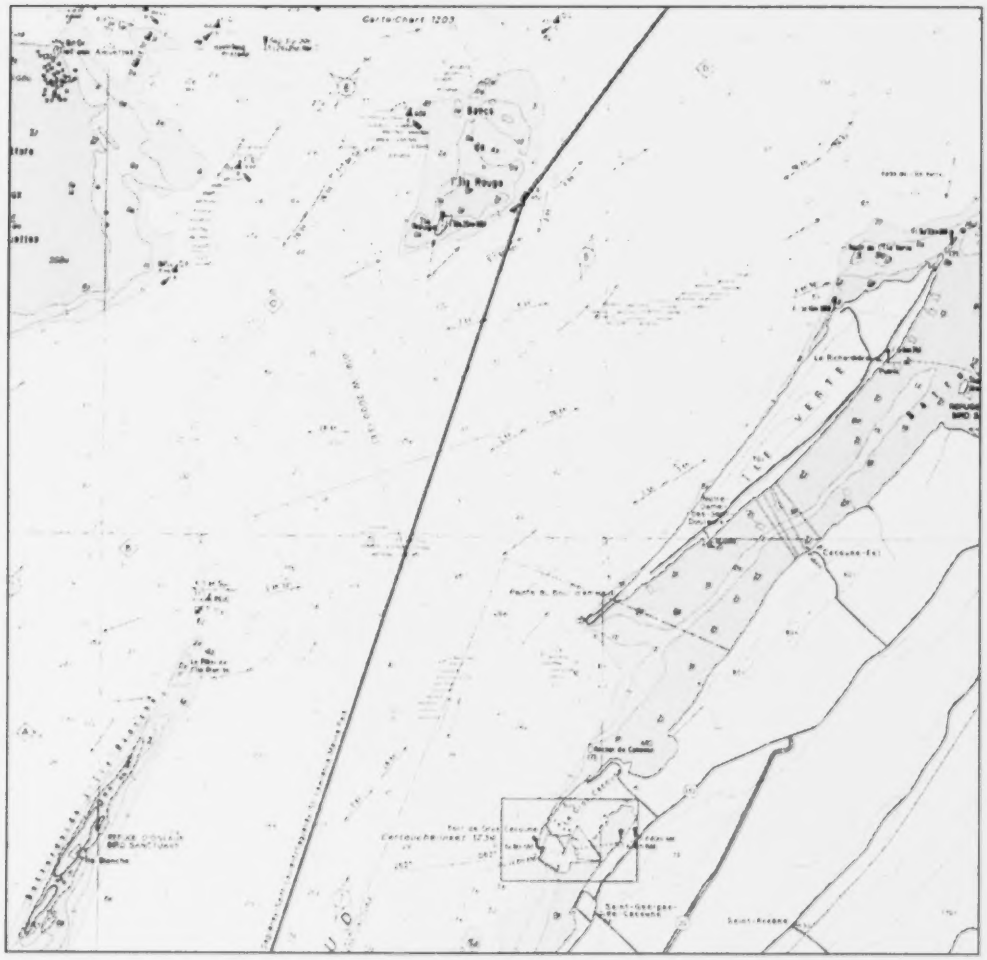
APPENDIX VII – MARINE CHART, LES ESCOUMINS TO GROS-CACOUNA



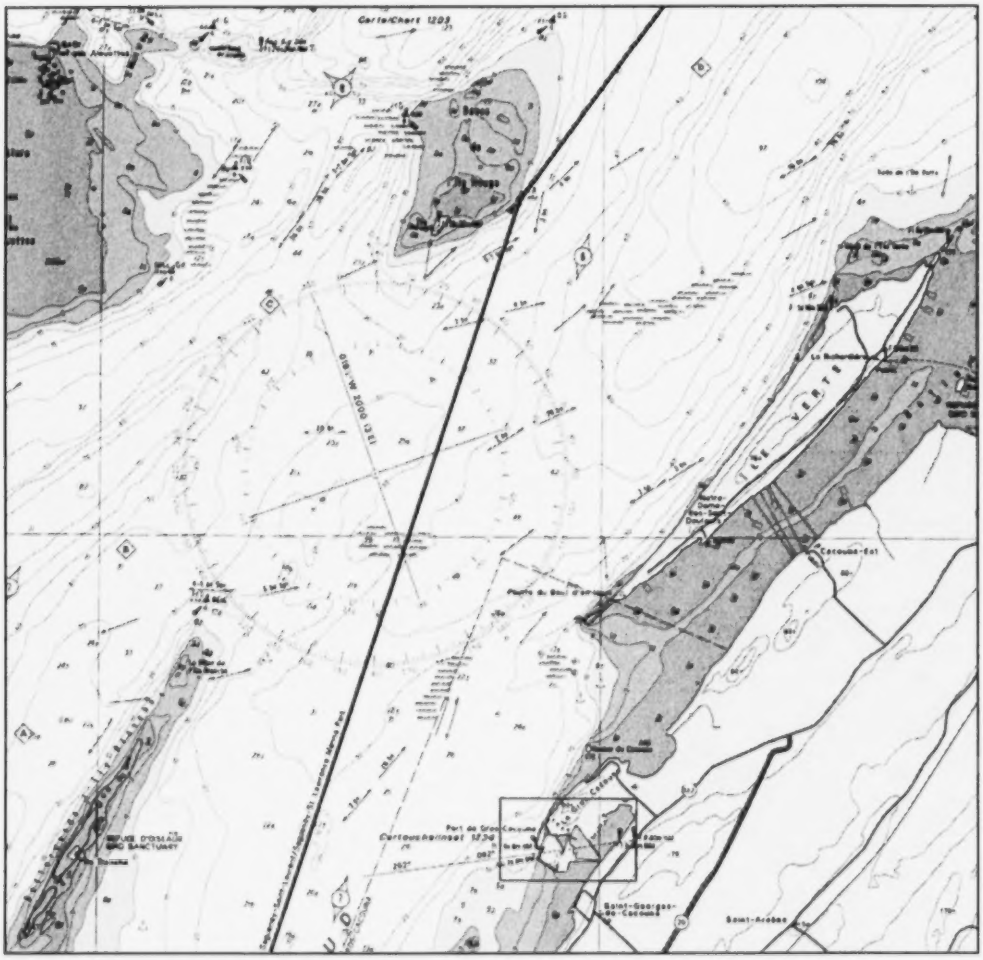
APPENDIX VII – MARINE CHART, LES ESCOUMINS TO GROS-CACOUNA



APPENDIX VIII – MARINE CHART, ÎLE ROUGE TO GROS-CACOUNA



APPENDIX VIII – MARINE CHART, ÎLE ROUGE TO GROS-CACOUNA



BIBLIOGRAPHY

Titles	Editors
« Assessment of the effects of release variables on the consequences of LNG spillage onto water using FERC models »	QIAO, Yuanhau. Harry H.West, M. Sam Mannan, David W. Johnson, John B. Cornwell. *Journal of Hazardous Materials*, 130 (2006) 155-162.
ISM Code (International Management Code) & Revised Guidelines on Implementation of the ISM Code by Administrations	MARINE SAFETY. 2002 Edition. IMO-IA117F.
Consequence Assessment Methods for Incidents Involving Releases from Liquefied Natural Gas Carriers	FEDERAL ENERGY REGULATORY COMMISSION. USA. ABSG Consulting Inc., 2004. 131-04 GEMS 1288209
Design and Construction Specification for Marine Loading Arms	OCIMF. London, England, Witherbys Publishing, Third Edition 1999, 63p.
Joint Industry Coast Guard Guidelines for the Control of Oil Tankers and Bulk Chemical Carriers in Ice Control Zones of Eastern Canada (JIGs)	TRANSPORT CANADA. 1995 Amendment No. 8, 18p.
Guidelines for a structure of an integrated system of contingency planning for shipboard emergencies	IMO. Resolution A.852(20), Adopted November 27, 1997, (item 9 on the agenda).
Sandia Report: Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water	SANDIA NATIONAL LABORATORIES. Mike Hightower et al., Albuquerque, USA, 2004. SAND2004-6258.
Inspection Guidelines for Ships Carrying Liquefied Gases in Bulk	OIL COMPANIES INTERNATIONAL MARINE FORUM (OCIMF). 2nd Edition 1998, 41p.
International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code)	INTERNATIONAL MARITIME ORGANIZATION. London, England, IMO Publishing, 1993 Edition, 166p.
ISGOTT: 5th Edition - International Safety Guide for Oil Tankers and Terminals	ICS & OCIMF. Witherbys Publishing, 5th Edition, 2006. ISBN 1 85609 291 7.
« LNG decision making approaches compared »	PITBLADO, Robin, John Baik, Vijag Raghunathan. *Journal of Hazardous Materials*, 130 (2006), 148-154. PMID: 16481101.
Liquefied Gas handling Principles: on Ships and in Terminals	MCGUIRE AND WHITE. SIGTTO, London, England. Whitherbys Publishing, Third Edition 2000, 160p.

Titles	Editors
Liquefied Gases : Marine Transportation and Storage	VAUDOLON, Alain. London, England, Witherbys Publishing, 2000, 178p. ISBN 1 85609 197 X.
Liquefied natural Gas (LNG) – Production, Storage and Handling	CANADIAN STANDARDS ASSOCIATION. November 2001. Z276-01
« Liquefied Natural Gas, Ensuring its Safe and Secure Marine Transportation »	U.S. DEPARTMENT OF HOMELAND SECURITY (USCG), *Proceedings of the Marine Safety and Security Council, the Coast Guard Journal of Safety at Sea*, Volume 62, Number 3, Fall 2005.
LNG Operations in Port Areas: Essential best practices for the industry Formerly: *LNG Operations in Port Areas, Recommendations for the Management of Operational Risk attaching to Liquefied Gas Tanker and Terminal Operations in Port Areas, First Edition.*	SIGTTO. London, England. Whitherbys Publishing, 2003, 34p.
Risk-based Design Methods for Aids to Navigation in the St. Lawrence River	TRANSPORT CANADA. August 1999. TP 13468E.
Routing Standards	MARINE SAFETY. 1991, 45p. TP 1802.
Winter Navigation on the River and Gulf of St. Lawrence: Practical Notebook for Marine Engineers and Deck Officers	MARINE SAFETY. 2005. TP 14335.
NFPA 59A: Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG). 2006 Edition	NATIONAL FIRE PROTECTION ASSOCIATION. Quincy, USA, 2005, 61p.
Plan d'urgence « préliminaire » : Le projet Énergie Cacouna (In French only)	ÉNERGIE CACOUNA. April 3, 2006 - Revision 1.
Termpol Review Process (2001)	MARINE SAFETY. Transport Canada, Ottawa, Canada. 2001. TP 743
Projet Soligaz : Rapport d'évaluation des aspects maritimes (In French only)	CANADIAN COAST GUARD. Septembre 1990. TP 10597F.
Collision Regulation	CANADA. *Canada Shipping Act*, CRC, Vol. XV, c. 1416.
Public Ports and Public Port Facilities Regulations	CANADA. SOR/2001-154 of the *Canada Marine Act*.
Marine Transportation Security Regulations	CANADA.. SOR 2004-144 under the *Marine Transportation Security Act*
« Navigation and Navigable Waters »	USA. *Code of Federal Regulations (CFR)*. Title 33-Navigation and Navigable Waters.

Titles	Editors
	Chapter I Coast Guard, Department of Homeland Security, part 165.
Sandia Report:Review of the Independent Risk Assessment of the Proposed Cabrillo Liquefied Natural Gas Deepwater Port	SANDIA NATIONAL LABORATORIES. Mike Hightower, Anay Luketa-Hanlin, Louis A.Gritzo, John M.Covan, Albuquerque, USA, January 2006. SAND2005-7339.
Safe Havens for Disabled Gas Carrier: An Information Paper For those Seeking a Safe Haven and Those Who May Be Asked to Provide It	SIGTTO. London, England, Third Edition, February 2003, 17p.
Safety Guide for Terminals Handling Liquefied Gases in Bulk	OIL COMPANIES INTERNATIONAL MARINE FORUM (OCIMF). Whitherbys Publishing, Second Edition 1993, 57p.
Site Selection and Design for LNG Ports and Jetties (Information Paper No.14)	SIGTTO. London, England, Witherbys Publishing, First Edition 1997, 25p. 185609 129 5.
Tanker Safety Guide (Liquefied Gas), Second Edition	ICS. London, England, Witherbys Publishing, 1995, 259p.
Tug Use in Port: A Practical Guide, Second Edition	HENSEN, Captain Henk. FNI London, England., The Nautical Institute, Witherbys Publishing, 2003, 192p.
Use of Risk Analysis for Emergency Planning of LNG Carriers	SKRAMSTAD, Erik. Det Norske Veritas, Stine U. Musæus, Capt. Steingrim Melbø, Norway Osprey Maritime, UK, 2000